

ABSTRACT

A semiconductor device, includes a semiconductor substrate having a first surface and a second surface opposite the first surface, and
5 having a piercing hole piercing there-through from the first surface to the second surface, an insulating film formed on the first surface of the semiconductor substrate having the piercing hole extended there-through and a piercing electrode
10 formed in the piercing hole and extending from the insulating surface to the second surface, wherein the piercing hole has a first diameter in the insulating film and a second diameter in the semiconductor substrate which is wider than the
15 first diameter, the piercing electrode has a substantially same diameter as the first diameter along a whole length thereof, and an insulating film sleeve lies between the piercing electrode and an inside wall of the piercing hole in the
20 semiconductor substrate.